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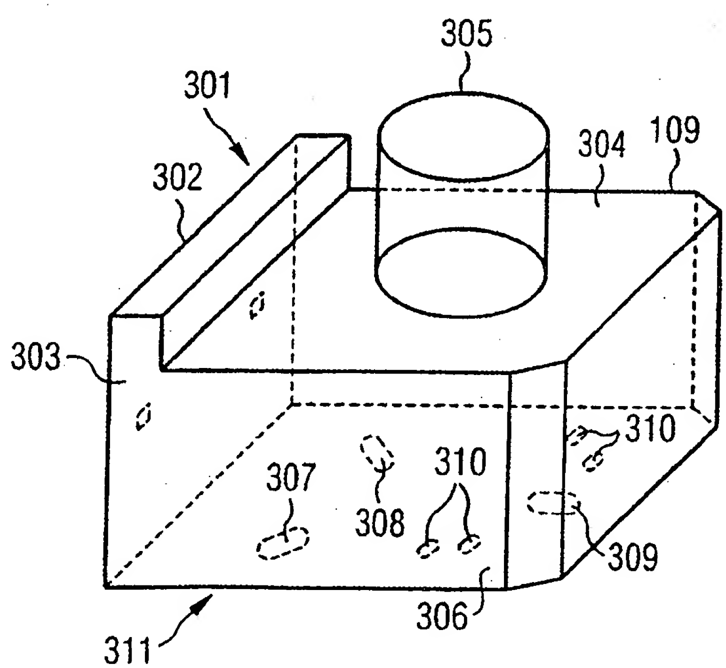
(54) Title: SEMICONDUCTOR WAFER POD



(57) Abstract: A semiconductor wafer pod comprises a measurement sensor (305) arranged within its housing (109) facing onto a surface of a wafer to be accommodated in the pod. The pod can be connected to the conventional load-port of a semiconductor wafer manufacturing tool. Thereby, measurement data can be collected immediately after wafer processing without a need to transport the wafer. The invention enables a cost-effective development of tool-integrated metrology.

WO 01/73824 A1

Description

Semiconductor wafer pod

The invention refers to a pod, for the accommodation of a semiconductor wafer, to be mechanically connected to the pod interface of a semiconductor manufacturing tool. The invention also refers to a method for performing a measurement on a wafer.

In a semiconductor factory wafers are stored and transported from one tool to another tool in a pod. The pods are standardised, so that the same pod is attachable to tools from different vendors. For the manufacture of 200 mm wafers open cassette pods or SMIF pods are used. An open cassette is a container wherein a number of wafers are arranged in parallel to each other. The open cassette is transported with the wafers being oriented almost vertical. The open cassette is attached to a tool after rotating by 90°. In 300 mm production, a so called FOUP (front opening unified pod) is used. The pod contains a number of 300 mm semiconductor wafers which are hermetically sealed within the pod, since the ambient air in the pod might have a better clean room class than the air outside the pod. The wafers are oriented horizontally in that pod, facing to an opening which is sealed by a door. When attached to the interface section of a tool, the door is removed and the wafers can be accessed by a wafer handler. In any case, the interface section as well as most of the geometric characteristics of the tool comply to various standards.

During semiconductor wafer manufacturing, the wafers have to be tested in order to monitor the quality of the process steps performed before. For example, such measurements comprise the measurement of film thickness, contamination by

number and location of particles, critical dimensions etc. In semiconductor manufacturing industry, measurement tool suppliers for integrated measurements are typically small engineering companies, who have difficulties to integrate their measurement apparatuses into expensive and advanced manufacturing tools. Especially cluster tools for CVD, plasma etch or lithography are highly automated and very expensive. When it is required to integrate measurement tools into manufacturing tools, there is a necessity to test the measurement equipment and its behaviour and interaction within the manufacturing tool during development. Currently, measuring sensors are integrated with big effort into the tools after some preliminary tests at a laboratory site. Since there is no effective test of the sensor system in production environment, it is hard to convince the manufacturing tool supplier to integrate the measurement sensor system into his tool. On the other hand, when testing the measurement system in the production environment, the integration cost will add up to a huge amount. Therefore, the development and integration of metrology into manufacturing tools is very costly and difficult to realize.

In WO 98/59229 a semiconductor pod is shown which includes sensors mounted to the housing of the pod in order to monitor the environment within the pod. Signals from the sensors are provided to a logging device which stores them for later retrieval or transmission. The sensors can monitor light intensitiy or spectrum, gases, particles and other properties of the environment within the wafer pod.

The objective of the invention is to provide a means that is able to facilitate the development and introduction of metrology equipment into existing semiconductor wafer manufacturing tools. Another objective of the invention is to pro-

vide an easy method for performing a measurement on a semiconductor wafer.

With respect to the means this objective is solved according to the invention by a pod for the accommodation of a semiconductor wafer comprising a housing, an interface section to be mechanically coupled to the pod interface of a semiconductor wafer manufacturing tool, a means for holding said semiconductor wafer arranged within the housing, and a measurement sensor arranged relative to the pod to face onto a surface of said wafer in order to interact with the surface of the wafer.

With respect to the method this objective is solved according to the invention by a method for performing a measurement on a semiconductor wafer on a tool for semiconductor wafer manufacturing, said tool comprising: a chamber for processing said wafer; a first interface for a first pod for receiving at least said wafer; a second interface for a second pod according to the invention; a wafer handler; said method comprising the steps of: removing said wafer from said first pod; placing said wafer into said chamber; processing said wafer in said chamber; placing said wafer into the means for holding a semiconductor wafer in the second pod before or after said step of processing; performing a measurement by a sensor arranged in said second pod; and placing said wafer back into said first pod.

By the invention, the pod which is normally used to provide wafers to be processed to a manufacturing tool is configured suitably in such a way, that at least a wafer and a measurement sensor are arranged within the pod. Thereby the measurement can be performed on the tool immediately after processing the wafer. The metrology is performed via the standardised interface by which the pod is connected to the tool.

Since there are usually more pod interfaces on the tool some of which are not used to provide wafers for processing, the pod according to the invention can be attached to a free load-port interface. The manufacturing process is not interrupted. Overall, the pod according to the invention is provided to the load-port of the tool and, seen from the tool, it behaves similar to a pod which carries wafers to be processed.

An advantage of the invention is that for certain measurement actions like particle tests, layer thickness measurement or critical dimension measurement during process development an immediate measurement is accomplished without a need for transportation of the wafer. This reduces the time needed for process development and also reduces the work load for stand-alone measurement tools which would be needed otherwise and which are usually very highly priced. In any case, the sensor is arranged to face onto a surface of the wafer. The surface of the wafer includes front side, back side as well as the edge of the wafer. The measurement technique envolves that the sensor interacts with the surface or the edges of the wafter. The interaction is preferably in a direct way, for example by means of mechanical or optical interaction. The invention is especially useful, when the sensor issues an optical signal which is reflected or scattered by the surface or edge of the wafer and is received by a receptor. In any cases the invention interacts with the wafer to measure a wafer property.

The modifications to the manufacturing tool are very reasonable. There are no or only minor hardware modifications necessary, since the modification is outside the tool in the pod. The only modification applies to a change in the control software for the wafer handling device, which is relatively easy and much less complicated than a change in the process

control software of the processing section of the tool. Since the metrology sensor system can be tested and improved and debugged on the manufacturing tool itself, it is much easier to integrate the sensor at other locations in the tool after a successful test. The sensor system in the pod according to the invention would even be suited to perform tool integrated measurement during mass production. The sensor system can stop the tool operation when the measurement results are beyond a specified range. Thereby enabling runtime control of the tool performance and easy fault detection. The invention is applicable to any pod which carries semiconductor wafers during wafer manufacturing in a factory. Practically, the invention may be used for 200 mm open cassettes and SMIF pods as well as for 300 mm FOUPs. Depending on the size of the metrology tool either the full system can be integrated into the pod or the sensor only is integrated into the pod and the measurement signals are evaluated outside the pod in a computer. During the development phase of the measurement system the hardware can be shrinked or custom-designed to fully fit into the housing of the pod. A wall of the housing can be provided with an adapter, so that different sensors are attachable. The adapter can be mounted on any wall of the pod housing, including top, left, right, bottom, etc. facets of the housing. Thus providing the capability to inspect or measure features on every side of the wafer, including the front side, the back side, as well as the edge of the wafer. Or, the housing may have two parts with a matching interface, whereas one part carries the sensor and is detachable from the other part, so that different sensors can be exchanged easily.

According to 300 mm FOUPs, the standard provides an option for a mechanical coding of FOUP characteristics via coupling grooves in the bottom plate of the housing. Thereby, the manufacturing tool can check the properties of the FOUP and

switch the program of the wafer handler for a correct interfacing with the pod incorporating the measurement sensor.

In the following, different preferred embodiments of the invention are described. The pod preferably contains a means for rotating the wafer. These means are preferably arranged in the bottom section of the pod. For mechanically decoupling vibrations which are introduced from the manufacturing tool, a heavy weight is carried by the bottom plate of the housing of the pod, for example a plate made of stone or granite or a shock absorbing apparatus. The wafer can be moved in and out of the housing of the pod for a measurement along the travelling track of the sensor across the wafer. When being rotated while moving in and/or out of the pod, all locations on the upper or the lower surface of the wafer can be inspected by the measurement sensor. The sensor may also be attached to a shifting means which moves the sensor across a surface of the wafer. The shifting means may provide a linear movement of the sensor. The sensor may either be moved in a direction perpendicular to the plane face of the interface section of the pod and the tool through which wafers are provided to the tool. When rotating the wafer and shifting the sensor along a diameter of the wafer across its surface, it is possible to inspect all locations on the wafer. The moving direction can also form an angle with respect to the direction perpendicular to the plane interface section, so that there is space provided for respective stopping means for stopping the movement of the sensor at the ends of the shifting means.

In either case, the sensor may further be rotated via an axis attached to the shifting means. The sensor may also be permanently fixed or rotationally fixed within the housing without any capability to shift. Hereby, all locations on the wafer can be inspected by the sensor when the wafer is rotated while being inserted into the pod.

When the pod comprises means for holding several wafers, the wafers should be suitably spaced, so that sensors can be placed between the wafers. When rotating the sensor on an axis which extends between the wafers, the upper surface of the lower wafer and the bottom surface of the upper wafer can be scanned by the sensor subsequently.

When computational equipment or other electronic devices, e.g. for measurement control and signal treatment, do not fit into the housing of the pod, preferably an electrical connector of matching plugs is mounted to one of the walls of the housing of the pod. Thereby, easy connection to a stand-alone computer is enabled.

When using the pod according to the invention, a first pod carrying wafers to be processed is attached to a first load-port. The second load-port is occupied by the pod comprising the sensor. A wafer is taken out of the first pod by a wafer handler and transported to a processing chamber, e.g. a CVD-chamber or a plasma etch chamber or another manufacturing equipment. The processed wafer is then transported to the second pod including the sensor and a measurement is performed. Any data are collected for further processing and evaluation. The data may also be used as an input signal into the tool to regulate any tool parameters in order to optimise the processing of further wafers. In addition to that or alternatively the wafer can be placed into the second pod for performing a pre-measurement before being processed.

The invention will now be described with respect to various embodiments depicted in the accompanying drawings. Corresponding elements are denoted with same reference numerals. The figures show:

Figure 1 shows a cluster tool with different process chambers 101, 102, 103, 104. Different process chambers may be used for different processing steps during the manufacture of semiconductor wafers. The processing chambers are provided with wafers through a factory interface 105. Pods containing a number of wafers are connected to the factory interface 105. The load-ports 111 and 112 have a standardised interface 106 and 107, resp., that fit to the pods. In the example, the pods may be designed according to the standard FOUP for 300 mm wafers. The load-port 106 is provided is a FOUP 108 containing the wafers to be processed. The load-port 107 is provided with a pod 109 according to the invention. This pod contains a measurement sensor.

During wafer manufacture, the wafer is taken out of the pod 108 at load-port 111 by a robot 110 and inserted into pod 109 to perform a pre-measurement if needed. Then the wafer is inserted into process chamber 103 and optionally into process chamber 104 for a processing step where the surface of the wafer is treated. These processing steps may involve chemical vapour deposition (CVD), etch, or other processing steps. Af-

ter the last processing step, the wafer is inserted again into pod 109 for an after-processing measurement. Finally the wafer is returned to conventional pod 108. The measurement performed in pod 109 may be a thickness measurement with a reflectometer, an ellipsometer, or a spectrophotometer. Other possible measurement methods may be particle measurement showing distribution and number of particles or critical dimension measurement via light scatterometry as well as measurement of temperature, raman spectroscopy, overlay, scatterometry or other measurement techniques. Depending on the measurement method, a fault detection can be performed or the tool can be tuned and re-adjusted to optimal processing performance. The perferred measurement techniques involve the optical interaction of the sensor with the wafer. Prefereably, the sensor system sends out a light beam which hits the wafer surface and is reflected or scattered and recepted by a receptor within the sensor system.

Referring to figure 3, the FOUP according to the invention complies to the standardised parameters, especially SEMI standard no. E57 (kinematic couping pins), E15 (load-port), E19 (FOUP). Especially the vertical and horizontal interface sections 301 and 311 are fully compatible with the standard features of a load-port, so that the pod can be attached to the load-port of the manufacturing tool in a conventional manner. The load-port comprises a plane, even front side which fits to the corresponding opening at the load-port of the tool. Wafers can be provided to the tool via the opening of the interface. The 300 mm wafer FOUP as well as the measurement pod are closed when idle. A door 303 is removed in the factory interface 105 of the tool to provide access for the wafer handler 110. It is important that the pod is closed when detached from the manufacturing tool, so that the inner space of the pod is not contaminated with air of the surrounding clean room which might have higher particle contami-

nation than the inside area of the pod and the manufacturing tool. The upper cover wall 304 of the housing of the pod can be removed. A sensor 305 is fixed to the cover 304 of the FOUP housing. The housing is provided with an adapter, where the sensor is attached to. When a measurement with a different sensor is desired, the sensor from the previous measurement is removed and another sensor is attached to the adapter. Alternatively, the cover 304 can be replaced by another cover with a different sensor. The adapter as well as the sensor can be arranged on any wall of the housing of the pod. The bottom plate 306 of the FOUP has three kinematic coupling grooves 307, 308 and 309 which serve for exact alignment of the pod. There are further provided four holes 310 which provide a code for the type of the pod. The holes 310 are checked by the load-port 112. This enables the wafer handler 110 to switch to the correct control program that operates the wafer handler 110. By that way, the wafer handler knows which position inside the pod is reserved for the reception of the wafer. Also, a fixed time delay for the measurement procedure can be set after which the wafer can be removed from the pod. Alternatively, the holes may be equipped with a mechanical switch which is controlled by the measurement equipment in the pod. The switch is operated when the measurement procedure is finished thereby indicating to the tool that the wafer can be removed from the pod.

The side-view to the tool of figure 2 shows a foot 201 for stabilising the pod 109. Especially, when the pod 109 is heavily loaded with equipment, the stabilising foot 201 supports the pod, so that the wafer to be measured in the pod 109 has a horizontal position and can be conveniently accessed by the handler 110. Rolls can be attached to the foot so that the pod can be pushed on the ground floor. When equipment for processing the signals provided by the sensor inside the pod 109 does not fit into the pod, an additional

carrier 202 outside the tool is provided to carry a computer 203 or additional electronic devices. The computer and/or electronic devices 203 is connected via a cable 204 to the electronic circuits and the sensor inside the pod 109. Also, power can be provided to the pod via cable 204. The pod comprises a connector 206 where a corresponding plug from cable 204 can be connected to.

The pod 109 may have a standard height corresponding to the height of a 13- or 25-wafer FOUP. Depending on the type of the sensor inside the pod the back side wall may have an oblique upper section. The pod may also be extended in the vertical direction indicated with numeral 205 to accommodate the sensor and electronic equipment. Preferably, a display is attached to the pod housing to provide status information or measurement results to the operator. With the stabilising foot 201 being installed, it is also possible to set the computer 203 on top of the pod 109. Since the dimensions in the vertical direction are relatively unrestricted and may be limited by the requirement of overhead transport systems only, this gives opportunity to install computational equipment or displaying devices onto the pod.

Figure 4 shows a top view onto a pod 109 according to the invention. A wafer 401 is shown in two positions 401a and 401b. While the wafer is moved into the inner space of the pod housing 402 by wafer handling means installed in the pod 109, it is rotated by the handling mechanics. This enables the sensor 403 to scan over the full surface of the wafer while rotating and being moved into the FOUP. In addition, the sensor may be rotated around an axis 404. The excentric rotation of the sensor may be stepwise or continously. The wafer handler may have a light emitting diode which senses reflections from inside the pod to determine which position of the pod carries a wafer. Light absorbing material should be attached

to the parts of the pod which are above and below the inserting position of the wafer. The light absorbing material signals to the wafer handler that only the reflecting position of the pod needs to be accessed and the remainder of possible wafer positions which absorb the light from the diode are not occupied by any wafers.

Referring now to figure 5, a pod 109 is shown with several wafers 501, ..., 505. Between two wafers, e.g. 501 and 502, at least one sensor 506 is arranged. The sensor 506 is fixed to a rotational axis 507 which extends in parallel between wafers 501 and 502. The measuring interface 508 of sensor 506 first measures the back side of wafer 501. Then, the sensor is rotated around axis 507 by 180°, so that the measurement interface 508 faces to the upper surface of wafer 502. With the exception of the sensors above wafer 501, all the other sensors inbetween two wafers in the pod 109 operate in the same way. Also, each of the wafers is rotated around the same vertical axis.

Figure 6 shows a cross-section through another FOUP 109, detailing different aspects of the invention. A wafer 601 is fixed to a holding mechanism 602, which is driven by a motor 603. The motor is arranged on a heavy plate 604, which lies on the ground section of FOUP 109. The plate 604 is a metal plate or is made of stone, especially granite. The plate 604 prevents any vibration caused by the rotation of the wafer 601 from coupling into the manufacturing tool. Prefereably, the measurement equipment 605 stands on the plate 604. Alternatively, the plate can be replaced by a known shock absorbing apparatus. The measurement equipment comprises a rail track 606 which is oriented perpendicular to the orientation of the load-port interface 301. A measurement device 607 travels in the rail 606 across the diameter of the wafer 601. The measuring device contains electronic circuits which

evaluate measured signals which are derived from sensoring window 608 of the sensoring device. The sensoring device may be a Michaelson Interferometer for measuring the deepness of a trench. When the wafer 601 rotates and the sensor 608 is being shifted along the wafer diameter, all locations on the upper surface of the wafer 601 can be inspected. In addition, the device 607 can be rotated around a vertical axis, so that the sensor 608 scans an area of the wafer surface along the travelling direction of the rail 606. The rail 606 may also be shifted across the axis parallel to the orientation of the load-port interface 301. The pod may be extended in vertical direction if the electronic equipment is too big to fit into the standard height of a conventional FOUP.

Figure 7 shows a top view onto another embodiment of the pod. The travelling rail 701 forms an angle with the orientation of the load-port interface 301 which is different from 90°. The travelling rail 701 extends from one corner 702 of the pod to the other corner 703 which is diagonal to corner 702. With the orientation of the travelling rail 701 shown in figure 7, there is enough space in the pod for electronic devices 704 that drive the sensor and sensoring electronic 705. Further, there is enough space in order to provide stopping means 706 which stops the movement of the sensor equipment 705.

Figure 8 shows a cross section through another embodiment according to the invention. The housing of the pod 109 contains a fixed measurement device 901, e.g. an FTIR (Fourier Transform Infra-Red Device). An infrared light beam 902 is guided by mirrors 903 and 904. The latter mirror 904 is arranged movably so that it can be shifted across the wafer 905 while the sensor is fixed. A light emitting source and a light receptor are fixed within the housing. An optical window 906 enables the infrared light beam 902 to impinge on the upper

surface of the wafer 905. The mirror 904 reflects the light beam from the source onto the surface of the wafer and also reflects the wafer reflected light back to the light receptor. The rotation of the wafer 905 is performed by cylindric roller elements 907 as is the case in figure 8. The pod also incorporates a measuring device 908 beneath the wafer 905 for the inspection of the back side of the wafer 905.

Preferably, the pod housing has an upper part 610 and a lower part 611. The part 610 can be detached from the part 611. The lower part 611 comprises the load-port interface 301. The borderline between the parts 610, 611 extends from the upper end of the load-port 301 to slightly above the end of the ground plate 612 of the pod housing. Also, other forms of the borderline between the upper and the lower parts of the housing are possible. The lower part 611 of the pod contains the rotation mechanism for the wafer 905. When removing the upper part 610 of the pod, the electronic devices inside can be repaired, adjusted or removed and replaced by different measurement equipment. A connector 613, which is arranged in the lower part 611 of the pod, connects the measurement electronics 901 to the rotation motor. The pod of the invention is made of plastic as is the standard FOUP or of aluminum or of any material which is clean room compatible.

The pod can be provided with at least two measurement sensors which are attached to an adapter located at the same wall of the pod housing or preferably at different walls of the pod housing. Thereby simultaneous measurements of two different wafer characteristics are enabled. At least two sensors can be controlled by each other. For example one sensor facing onto the top side of the wafer provides focus information, whereas the other sensor measures any wafer characteristic by inspecting the wafer edge. Another joint measurement technique comprises the same type of sensors, which measure the

same characteristic of the wafer from different locations or different surfaces of the wafer. The measurement results are combined, providing a single joint value for said wafer characteristic.

As stated above, the single or at least two measurement sensors can be located within the housing if space is available. One of the sensors may be mechanically arranged in such a way that the measurement angle with respect to the wafer can be varied, thus enabling multi-angle measurement.

Claims

1. Pod for the accomodation of a semiconductor wafer (401, 501, ..., 505, 601, 905) comprising a housing (109), an interface section (301) to be mechanically coupled to the pod interface of a semiconductor wafer manufacturing tool (105), a means (602, 907) for holding said semiconductor wafer arranged within the housing, and a measurement sensor (403, 506, 608, 705, 901) arranged relativ to the pod to face onto a surface of said wafer in order to interact with the surface of the wafer.

2. Pod according to claim 1,
characterised in that
said means for holding said semiconductor wafer comprising a rotation means (603) to rotate said semiconductor wafer.

3. Pod according to claim 2,
characterised in that
said rotation means (603) being apted to move said semiconductor wafer into and out of the inner space of the housing (109).

4. Pod according to claim 3,
characterised in that
said semiconductor wafer is being rotated while moving into or out of the inner space of the housing (109).

5. Pod according to any of claims 1 to 4,
characterised in that
said sensor is attached to a shifting means (606, 701) to shift the sensor above a surface of said semiconductor wafer.

6. Pod according to claim 4 or 5,
characterised in that

said interface section (301) having a plane surface to be connected to said manufacturing tool (105), said shifting means extending in a linear direction which crosses the surface of the interface section perpendicularly.

7. Pod according to claim 5,
characterised in that
said shifting means (701) extends in a linear direction across said semiconductor wafer from a first corner (702) of the housing to the a second corner (703) of said housing which is diagonal to said first corner (702).

8. Pod according to any of claims 1 to 7,
characterised in that
said sensor is being rotated around an axis perpendicular to the surface of said wafer, when said wafer is moved into said inner space of said housing or when said sensor is being shifted across the surface of said wafer.

9. Pod according to any of claims 1 to 4,
characterised in that
said sensor (901) is fixed within the housing (109) for the emission and reception of a light beam to impinge on the surface of said semiconductor wafer (905), comprising a mirror (904) to be shifted above the surface of said semiconductor wafer (905) to reflect the light beam onto and from said surface of said semiconductor wafer (905).

10. Pod according to any of the claims 1 to 9,
characterised in that
said housing having a side wall (303), a ground wall (306) and a top wall (304), said sensor comprising a sensor device for interaction with said surface of said wafer and signal treatment device processing a signal from said sensor device,

said processing device extending through one of said walls of the housing.

11. Pod according to any of the claims 1 to 10, characterised in that an electrical connector (206) is arranged in one of the walls of said housing, said connector (206) is coupled to the sensor and said connector (206) forming an electrical interface from the sensor to an evaluation device (203) to be positioned outside said housing.

12. Pod according to any of the claims 1 to 10, characterised in that said housing has a bottom part (611) for accommodating said wafer and said interface section (301) and having a top part (610), said top part (610) being removable from said bottom part (611).

13. Pod according to any of the claims 1 to 10, characterised in that it comprises a means for holding a further wafer (502, ..., 505) whereby said sensor (506) is arranged between said wafers (501, 502) and in that said sensor (506) is rotateably arranged with a rotation axis (507) extending between said wafer (501) and said further wafer (502).

14. Pod according to any of the claims 1 to 13, characterised in that said measurement sensor is a first measurement sensor and in that a second measurement sensor is provided, arranged relative to the pod to face onto a surface of said wafer, said second measurement sensor being controlled in response to a signal obtained by said first measurement sensor.

15. Pod according to any of the claims 1 to 14, characterised in that the pod complies to SEMI standard no. E57 or E19 or said pod interface of the semiconductor wafer manufactureing tool comprises a load-port (111, 112) which complies to SEMI standard no. E15.

16. Method for performing a measurement on a semiconductor wafer (401, 501, ..., 505, 601, 905) on a tool for semiconductor wafer manufacturing, said tool comprising:
- a chamber (103, 104) for processing said wafer;
- a first interface (106) for a first pod (108) for accommodating at least said wafer;
- a second interface (107) for a second pod (109) according to any of said preceding claims 1 to 14;
- a wafer handler (110);

said method comprising the steps of:
- removing said wafer from said first pod (108);
- placing said wafer into said chamber (103, 104);
- processing said wafer in said chamber (103, 104);
- placing said wafer into the means for holding a semiconductor wafer in the second pod (109) before or after said step of processing;
- performing a measurement by a sensor arranged in said second pod (403, 506, 608, 705, 901); and
- placing said wafer back into said first pod (108).

17. Method according to claim 16, characterised in that it further comprises the step of controlling a parameter for the step of processing said wafer in response to a signal obtained during said step of performing a measurement.

FIG 1

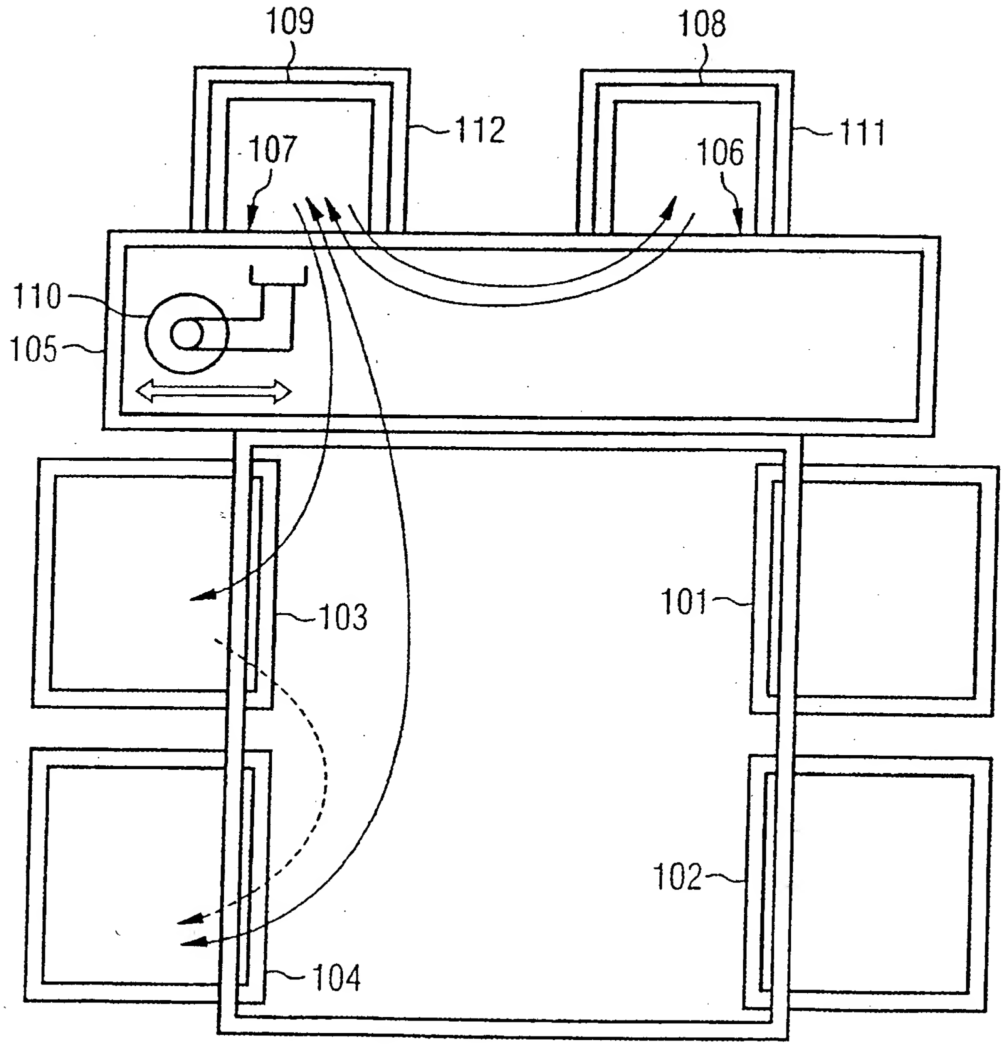


FIG 2

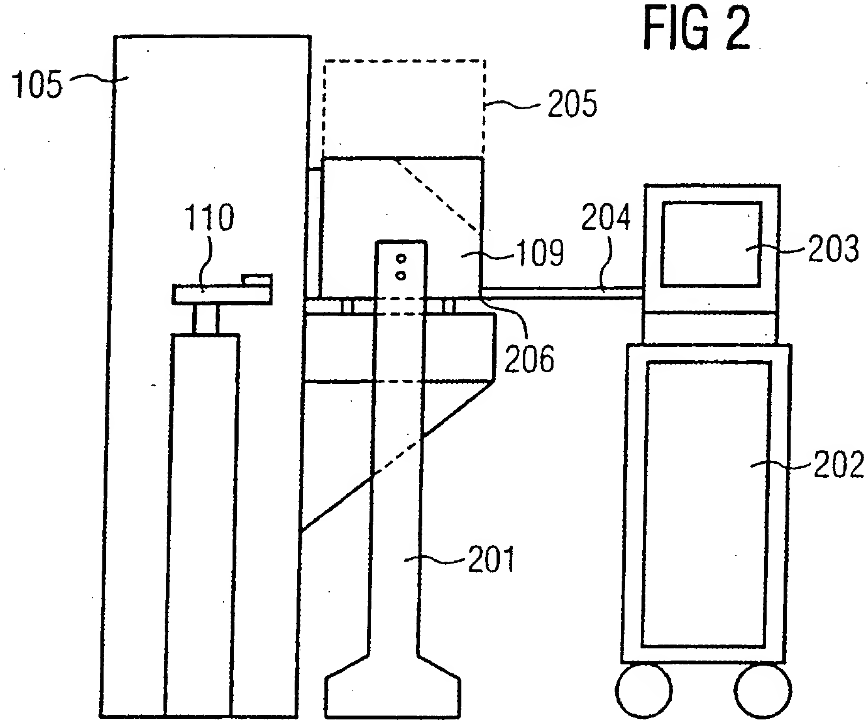

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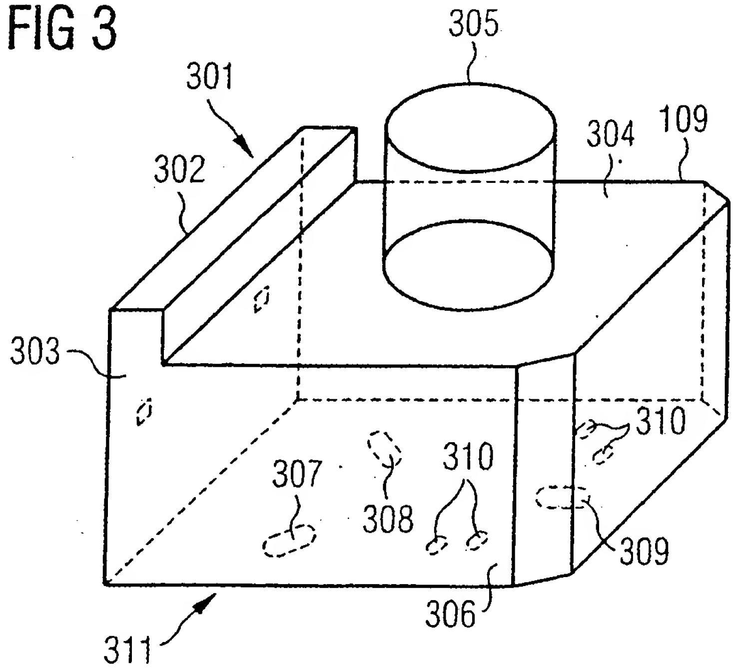
FIG 3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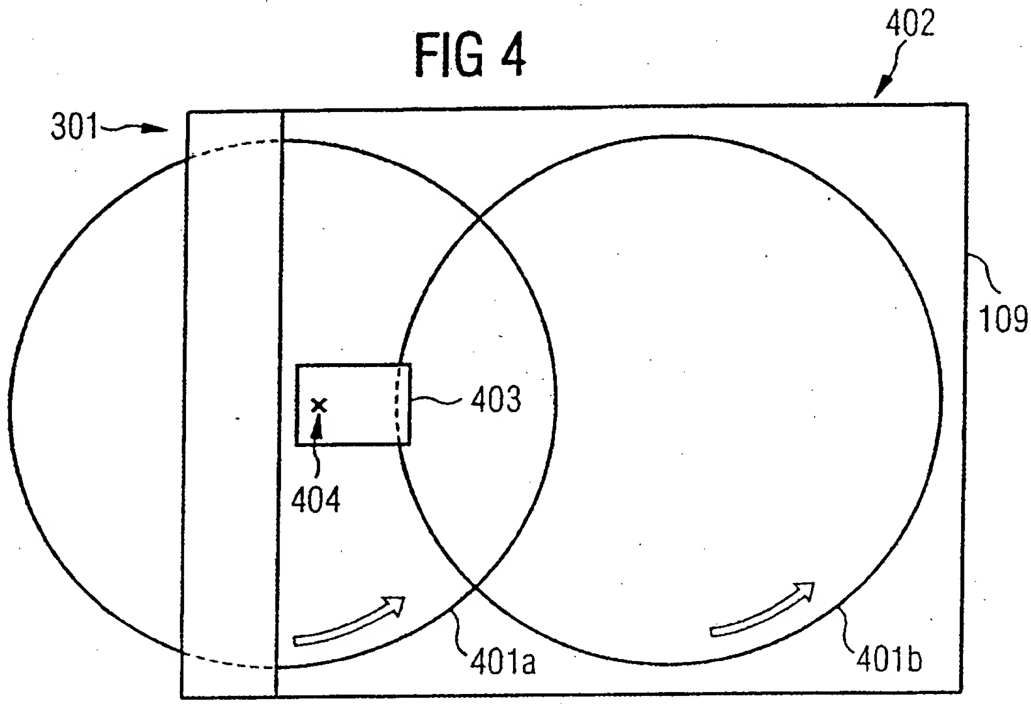
311

FIG 4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301
109
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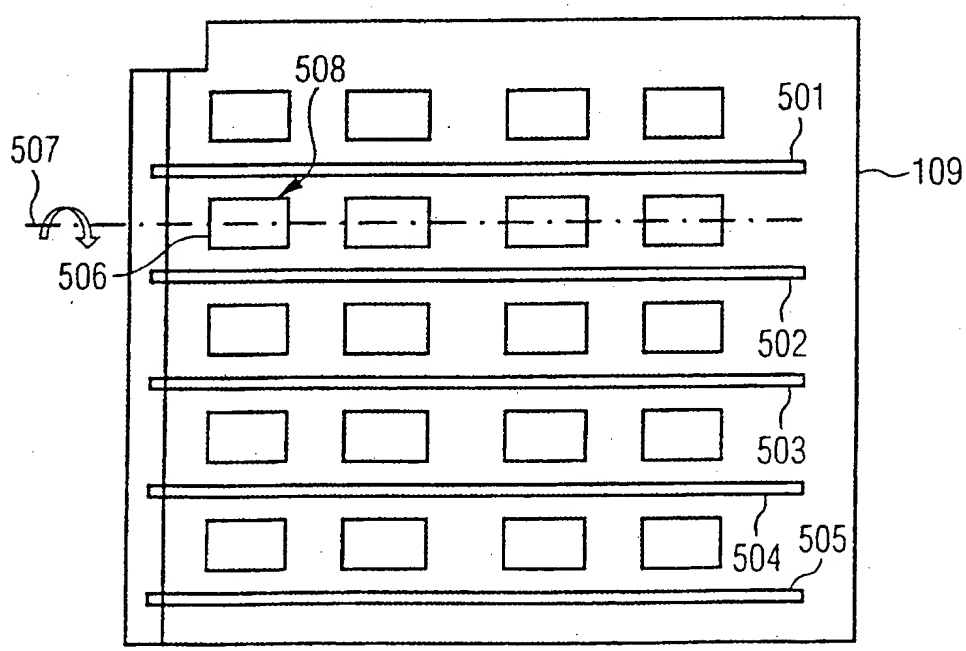
404
401a
401b

FIG 5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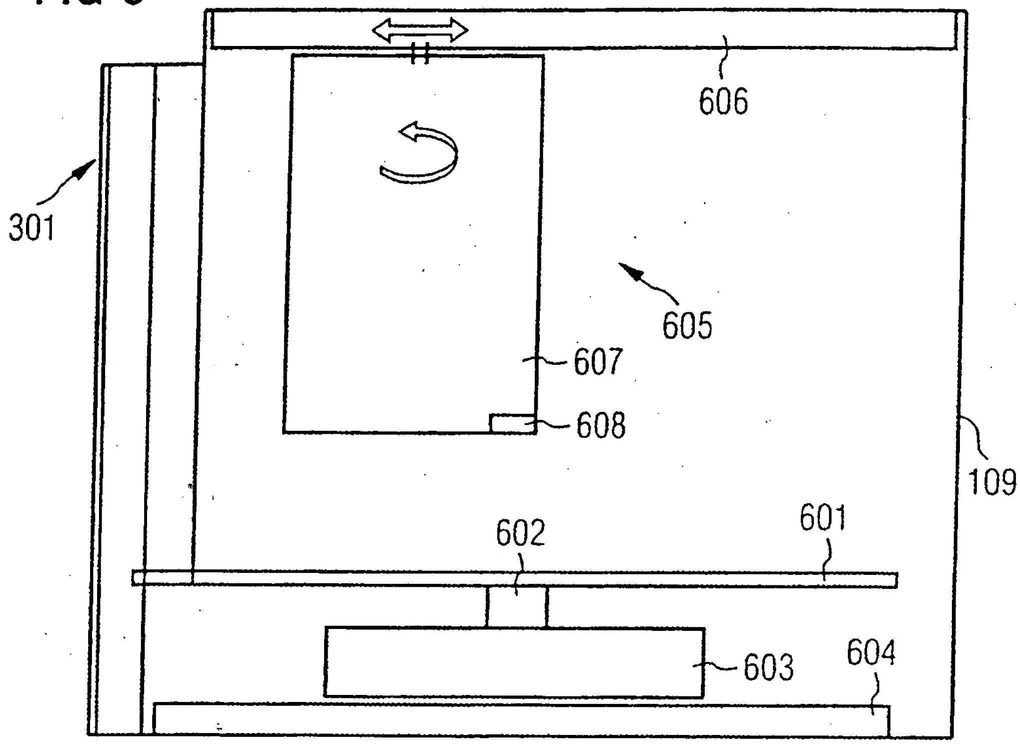
505

FIG 6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608
109
602
601
603
604

FIG 7

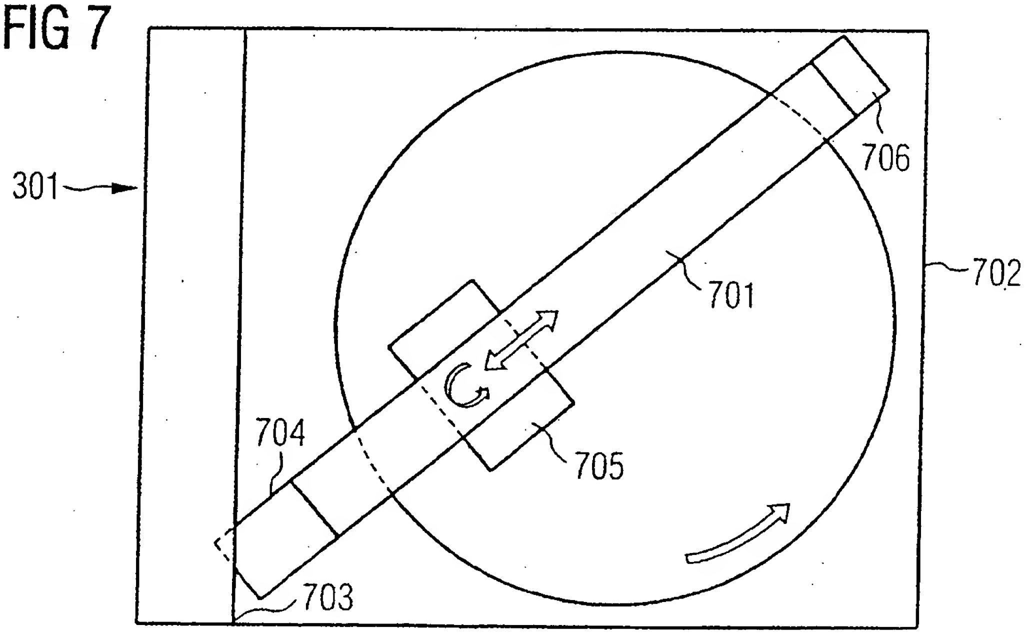
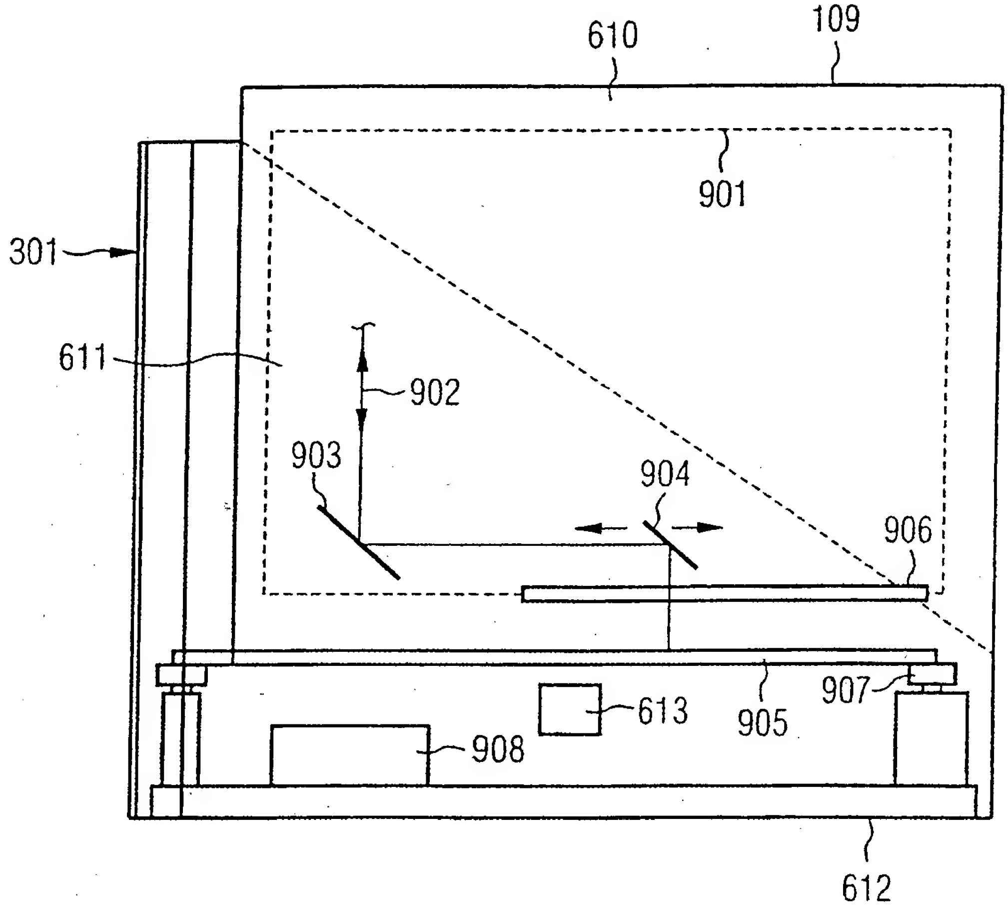

706
301
702
701
704
705
703

FIG 8



INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP 01/02504

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H01L21/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H01L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	WO 99 49502 A (LEHIGHTON ELECTRONICS INC ;BLEW AUSTIN R (US)) 30 September 1999 (1999-09-30) abstract; claims; figures	1,10-12 16,17
Y	US 5 905 302 A (SUNDAR SATISH ET AL) 18 May 1999 (1999-05-18) abstract column 6, line 55 -column 8, line 17	16,17
X A	WO 98 59229 A (GENCO ROBERT M ;HENRY STEVEN J (US)) 30 December 1998 (1998-12-30) cited in the application the whole document	1,10-12 13,15

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
28 June 2001	05/07/2001

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Hamdani, F

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 266 812 A (MOKUO SHORI) 30 November 1993 (1993-11-30) abstract; claims; figures column 1, line 55 -column 2, line 26	1,10-12
A	US 5 980 188 A (KIM KYUNG-SOO ET AL) 9 November 1999 (1999-11-09) abstract column 1, line 54 -column 2, line 36	1,9
A	US 5 308 993 A (HOLMAN GEORGE T ET AL) 3 May 1994 (1994-05-03) abstract; figures	1,9

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

Intern... al Application No
PCT/EP 01/02504

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9949502 A	30-09-1999	AU 3112599 A	18-10-1999
		EP 1066649 A	10-01-2001
		US 6205852 B	27-03-2001
		US 6202482 B	20-03-2001
US 5905302 A	18-05-1999	NONE	
WO 9859229 A	30-12-1998	NONE	
US 5266812 A	30-11-1993	JP 2984958 B	29-11-1999
		JP 5090389 A	09-04-1993
		US 5319216 A	07-06-1994
US 5980188 A	09-11-1999	JP 10321699 A	04-12-1998
US 5308993 A	03-05-1994	NONE	